

WHAT IS CLAIMED IS:

1. A process for immobilizing a waste comprising one or more of radionuclides, hazardous elements, and hazardous compounds comprising the steps of:

integrating the waste with an immobilizing mineral to produce a waste integrated mineral, wherein the one or more of radionuclides, hazardous elements, and hazardous compounds represents at least about two weight percent of the waste integrated mineral; and

encapsulating the waste integrated mineral in a surrounding matrix comprising one of rock and glass to form a waste product.

2. The process of claim 1, further comprising the step of creating an effective covering of the waste integrating mineral using one of an overgrowth procedure and a sintering process before the encapsulating step.

3. The process of claim 1, further comprising the step of burying the waste product within an indigenous rock, wherein the indigenous rock and the surrounding matrix comprise at least one common component.

4. The process of claim 1, wherein the integrating step involves contacting the immobilizing mineral with a solution containing the waste.

5. The process of claim 1, wherein the integrating step involves mixing components of the immobilizing mineral with the waste at an elevated temperature.

6. The process of claim 1, wherein the integrating step involves heating the waste containing the immobilizing mineral at an elevated temperature.

7. The process of claim 2, wherein the effective covering is at least two microns thick.

8. An encapsulated waste product comprising:

a waste integrated mineral comprising an immobilizing mineral and a waste comprising one or more of radionuclides, hazardous elements, and hazardous compounds, wherein the one or more of radionuclides, hazardous elements, and hazardous compounds represent about two weight percent or more of the waste integrated mineral; and

a surrounding matrix which surrounds the waste integrated mineral, wherein the surrounding matrix comprises one of rock and glass, and wherein the surrounding matrix comprises at least one component that is in common with components of the immobilizing mineral.

9. The waste product of claim 8, wherein the surrounding matrix represents less than 30 weight percent of a total weight of the encapsulated waste product.

10. The waste product of claim 8, wherein the surrounding matrix comprises at least one mineral that is in common with an indigenous rock of a disposal site.

11. The waste product of claim 8, wherein the immobilizing mineral is one of phosphates, silicates, oxide, and clays.

12. The waste product of claim 8, wherein the waste comprises an element of actinides and lanthanides.

13. The waste product of claim 8, wherein the immobilizing mineral is one of loparite, apatite, sphe, feldspar, plagioclase, sodalite, nepheline, thorite, zircon, monazite, and calcium-zeolite.

14. The waste product of claim 8, wherein the one or more of radionuclides, hazardous elements, and hazardous compounds replace elements in the crystal lattice of the immobilizing mineral.

15. The waste product of claim 8, further comprising an effective covering between the waste integrated mineral and the surrounding matrix.

16. The waste product of claim 15, wherein the effective covering is at least two microns thick.

17. The waste product of claim 15, wherein the effective covering contains little or no radionuclides, hazardous elements, and hazardous compounds.

18. The waste product of claim 15, wherein the surrounding matrix comprises additional waste oxide.

19. A process for immobilizing a solid waste comprising one or more of radionuclides, hazardous elements, and hazardous compounds comprising the steps of:

heating the solid waste containing components of an immobilizing mineral at an elevated temperature to create a waste integrated mineral; and

encapsulating the waste integrated mineral with one or both of an effective covering and a surrounding matrix,

wherein the effective covering is created using one of an overgrowth procedure and a sintering process, and

wherein the surrounding matrix comprises one of rock and glass.

20. The process of claim 19, further comprising the step of mixing components of the immobilizing mineral before or during the heating step.